2765E [illegible] 1993 FILE COPY

1991-1992
AIR QUALITY DATA SUMMARY

REGIONAL MUNICIPALITY OF WATERLOO AND THE COUNTIES OF WELLINGTON AND BRANT

NOVEMBER 1993

Ontario

Ministry of
Environment
and Energy

ISSN 0840-7843

1991 - 1992 AIR QUALITY DATA SUMMARY
REGIONAL MUNICIPALITY OF WATERLOO AND THE COUNTIES OF WELLLINGTON AND BRANT

NOVEMBER 1993

Cette publication technique
n'est disponible qu'en anglais.

Copyright: Queen's Printer for Ontario, 1993
This publication may be reproduced for non-commercial purposes
with appropriate attribution.

PIBS 2765

1991 - 1992 AIR QUALITY DATA SUMMARY
REGIONAL MUNICIPALITY OF WATERLOO AND THE COUNTIES OF WELLINGTON AND BRANT

Report prepared by:

F. Dobroff
West Central Region
Ontario Ministry of Environment and Energy

TABLE OF CONTENTS

PAGE

INTRODUCTION 1

MONITORING NETWORK 2

POLLUTANTS MONITORED 4

DATA ANALYSIS

Brantford 13
Fergus 16
Guelph 19
Kitchener/Waterloo 25

SUMMARY 33

APPENDIX

Particulate Survey of Witco Chemicals Brantford

LIST OF FIGURES

		PAGE
Figure 1	Wind Frequency Distribution - Cambridge	3
2	Brantford Air Monitors	15
3	Fergus Air Monitors	18
4	Guelph Air Monitors	22
5	Sulphur Dioxide - Guelph - Trend	23
6	Soiling Index - Guelph - Trend	23
7	Ozone - Guelph - Trend	24
8	Kitchener/Waterloo Air Monitors	29
9	Sulphur Dioxide - Kitchener/Waterloo - Trend	30
10	Soiling Index - Waterloo - Trend	30
11	Nitrogen Dioxide - Kitchener - Trend	31
12	Carbon Monoxide - Kitchener - Trend	31
13	Ozone - Kitchener/Waterloo - Trend	32

LIST OF TABLES

		PAGE
Table 1a	Air Quality Index - Frequency Distribution West Central Region - 1991	9
1b	Air Quality Index - Frequency Distribution - 1992	11
2	Particulates (Dustfall) Near Witco Chemicals - Brantford	14
3	Particulates (Dustfall) Near GSW Water Products Co. - Fergus	17
4	Guelph Air Quality Statistics-Continuous Monitors	21
5	Kitchener Air Quality Statistics - Continuous Monitors	27
6	Waterloo Air Quality Statistics - Continuous Monitors	28

INTRODUCTION

This report summarizes the results of air monitoring in the Regional Municipality of Waterloo, and the Counties of Wellington and Brant in 1991 and 1992.

The Ministry of Environment and Energy's West Central Region has conducted monitoring in the area since the early 1970's. The Air Management Program in Ontario is based on controlling man-made emissions to meet ambient air quality objectives, which in turn are based on known effects on health, quality of life or sensitive vegetation, whichever is most stringent. To achieve these objectives, sources of pollution are identified, their emissions evaluated and appropriate control measures are instituted. Ambient air monitoring is used to identify pollution sources, evaluate the need for controls and then determine whether controls have been successful.

In addition to monitoring specific industrial sources, monitoring of a more general nature is also carried out in various localities to determine if air quality objectives are being met and to observe trends in air pollution.

In June, 1988, the Ministry commenced broadcasting the new Air Quality Index across the Province at over 30 locations, including Guelph, Kitchener and Waterloo. A description of the AQI and the 1991 and 1992 results appear in this report.

MONITORING NETWORK

The Ministry of Environment and Energy's West Central Region operated a network of monitors in Brantford, Fergus, Guelph, Kitchener and Waterloo. Some of the monitoring was performed near industrial sources, in many cases, as a response to local complaints. Monitoring of a more general nature was also carried out at single stations in Guelph, Kitchener and Waterloo to characterize air quality in larger population centres and to measure the Air Quality Index.

The Ministry installed its own wind tower equipment in Cambridge in 1991 for measurement of wind speed and direction. Figure I illustrates the typical wind frequency distribution for the area and shows that winds from the southwest, west and northwest quadrants predominate about 40% of the time. Consequently, wherever possible, stations are located downwind of suspected pollution sources with respect to these winds.

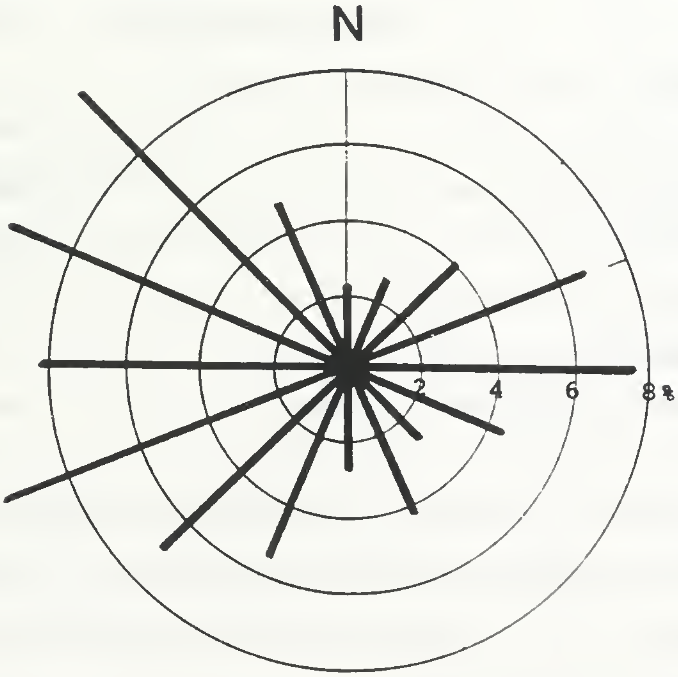
Some of the equipment used in the network is provided by Environment Canada under the National Air Pollution Surveillance (NAPS) program. The instruments are operated and maintained by the Ministry and data from the NAPS stations are provided to Environment Canada.

FIGURE 1

WIND FREQUENCY DISTRIBUTION

26066 - CLYDE RD.

CAMBRIDGE 1992



Calm 8.1%

Lines indicate direction from which wind blew

POLLUTANTS MONITORED

Two basic types of air pollutants are measured - gases and particulates (dust).

a) Gases measured with continuous analyzers include:

Sulphur Dioxide (SO_2) - monitored in Guelph, Kitchener and Waterloo for general ambient levels. SO_2 is a product of fuel combustion. Air quality objectives and their limiting factors are:

1-hour average - .25 ppm (vegetation effects)
24-hour average - .10 ppm (health effects in conjunction with particulates)
1-year average - .02 ppm (vegetation effects)

Carbon-Monoxide-(CO) - general ambient levels are measured in Kitchener. The major source of CO is the automobile. Objectives for CO are:

1-hour average - 30 ppm (health effects)
8-hour average - 13 ppm (health effects)

Ozone (O_3) - measured in Kitchener, Waterloo and Guelph to check general ambient levels. Oxidants are products of photochemical reactions involving oxides of nitrogen, hydrocarbons and sunlight. Ozone accounts for most of the oxidants produced. The sources of the precursor pollutants are mainly industrial and automotive. Concentrations follow very definite annual trends with highest levels occurring during the summer, and daily trends with highest levels occurring in mid-afternoon. Both patterns are directly related to temperature and the amount and intensity of sunlight.

Ozone and its precursors can be transported over great distance and can be augmented by local sources. Most of the high levels in Southern Ontario each summer arrive from the United States. An objective for ozone is:

1-hour average - 80 ppb (vegetation effects)

Oxides of Nitrogen - general ambient levels were measured in Kitchener. They are a product of high temperature combustion sources including the automobile. The most abundant oxides are nitric oxide (NO) and nitrogen dioxide (NO_2). Objectives exist only for NO_2:

1-hour average - .20 ppm (odour)
24-hour average - .10 ppm (health effects)

b) Particulates (dust) were measured by three methods, each relating to a different size range of particles.

Dustfall - heavy visible material generally greater than 10 microns in size (one micron is one-millionth of a metre) that settles out of the atmosphere due to gravity. A plastic container is exposed for one month and the collected dust is weighed and expressed as a deposition rate of grams/square metre/30 days. The measurement is imprecise and observations are restricted to relatively local areas. However it is a practical method of measuring the visible dust which often causes complaints. Criteria are:

1-month average - 7.0 g/m^2/30 days (nuisance effects)
1-year average - 4.5 g/m^2/30 days (nuisance effects)

Total Suspended Particulates (TSP) - measured with high volume (hi-vol) samplers near industrial sources and for general ambient observations. The particles range from submicron to about 50 microns in size. The hi-vol sampler draws air through a glass fibre filter for a 24-hour period. The exposed filter is weighed and the weight of the solids collected is converted to an equivalent concentration in air expressed in micrograms per cubic metre. The samplers run once every six days. Criteria based on visibility and health effects are:

24-hour average - 120 ug/m^3
1 year geometric mean - 60 ug/m^3

Soiling Index (Coefficient of Haze) - general ambient levels were measured in Kitchener, Waterloo and Guelph by tape samplers which measure fine particles less than 10 microns. Coefficient of haze tape samplers determine hourly soiling values. Air is drawn through a filter paper tape for one hour. A beam of light is shone through the paper before and after the airborne particles are collected. The difference in light transmission is translated into a coefficient of haze (COH) unit. The paper tape then advances and a new hourly sample is collected. The criteria shown below are based largely on correlations with total suspended particulate (TSP).

24-hour average - 1.0 COH's/1000 linear feet of air
1-year average - .5 COH's/1000 linear feet of air

c) Air Pollution Index (API) - the API has been measured since 1970 and is now incorporated as a subindex of the new air Quality Index (AQI). It is derived from 24-hour average concentrations of sulphur dioxide and soiling index, based on the following equation:

Kitchener, Waterloo and Guelph

$$API = 3.33\ (9.1\ COH + 120.8\ SO_2).$$[74]

where:

COH is the 24-hour average soiling index concentration expressed in coefficient of haze units.

SO_2 is the 24-hour average concentration of sulphur dioxide expressed in parts per million.

Air Quality Index (AQI) - the AQI is a more comprehensive information system by which the public can be informed about air quality on a daily and even hourly basis. The index includes the API (described above) which had been in place since 1970. In the AQI, hourly concentrations of sulphur dioxide, soiling index (particles), nitrogen dioxide, carbon monoxide, ozone and reduced sulphur compounds are all converted to a common scale of numbers. In addition to these hourly measurements, 8-hour average levels of carbon monoxide and the API, a function of sulphur dioxide and particles are also included as subindices, making a total of 8 potential subindices measured every hour. The official AQI broadcast is the highest subindex at that time.

The AQI scale is classified as follows:

0 - 15	Very Good
16 - 31	Good
32 - 49	Moderate
50 - 99	Poor
100+	Very Poor

Index levels up to 31 should have little or no effect on people and the environment. Beginning at the moderate level, effects such as odour, vegetation damage and some health effects to sensitive individuals start to occur.

In the poor and very poor categories, these symptoms become more and more acute, such that virtually all people would be hampered in the very poor range.

When moderate levels or higher are measured, public health advisories can be issued to the public along with the actual index number.

The AQI started in June 1988, and annual 1991 and 1992 statistics on hourly frequencies in the five concentration categories for nine West Central Region stations are presented in Table 1a and 1b.

As can be seen, ozone (O_3) was generally the most problematic pollutant across the region. This pollutant and others in the AQI will be discussed in more detail in this report.

TABLE 1a
AIR QUALITY INDEX - 1991
WEST CENTRAL REGION
HOURLY FREQUENCY DISTRIBUTION

		0 - 15 Very Good	16 - 31 Good	32 - 49 Moderate	50 - 99 Poor	100+ Very Poor
26029/60	SO_2	8654	0	0	0	0
KITCHENER	COH	7835	76	1	0	0
	O_3	7301	783	77	0	0
	NO_2	8129	0	0	0	0
	CO 1 hr	8729	0	0	0	0
	CO 8 hr	8729	0	0	0	0
	API	7780	48	0	0	0
26045	SO_2	8713	0	0	0	0
WATERLOO	COH	8478	21	0	0	0
	O_3	8202	380	8	0	0
	API	8486	0	0	0	0
28028	SO_2	8708	0	0	0	0
GUELPH	COH	8341	10	0	0	0
	O_3	7633	751	134	0	0
	API	8343	0	0	0	0
27067	SO_2	8707	0	0	0	0
ST. CATHARINES	COH	8092	66	6	0	0
	O_3	7432	782	44	0	0
	NO_2	8656	0	0	0	0
	CO 1 hr	8711	0	0	0	0
	CO 8 hr	8711	0	0	0	0
	API	8132	45	0	0	0
27056	SO_2	8677	0	0	0	0
NIAGARA FALLS	COH	8202	14	0	0	0
	O_3	6910	788	143	0	0
	NO_2	8179	14	0	0	0
	API	8711	0	0	0	0

TABLE 1a
AIR QUALITY INDEX - 1991
WEST CENTRAL REGION
HOURLY FREQUENCY DISTRIBUTION

		0 - 15 Very Good	16 - 31 Good	32 - 49 Moderate	50 - 99 Poor	100+ Very Poor
29000 HAMILTON DOWNTOWN	SO_2	8721	0	0	0	0
	COH	8257	422	22	0	0
	O_3	8179	477	37	0	0
	NO_2	8656	1	0	0	0
	CO 1 hr	8564	0	0	0	0
	CO 8 hr	8564	0	0	0	0
	TRS	8545	90	11	0	0
	API	7807	891	12	0	0
29105 HAMILTON EAST	SO_2	8712	0	0	0	0
	COH	8557	172	5	0	0
	O_3	7571	751	155	1	0
	API	8543	202	0	0	0
29114 HAMILTON MOUNTAIN	SO_2	8671	0	0	0	0
	COH	8351	97	1	0	0
	O_3	7913	674	85	0	0
	NO_2	3823	0	0	0	0
	TRS	8393	28	1	1	0
	API	8240	196	0	0	0
29118 HAMILTON WEST	SO_2	8559	0	0	0	0
	COH	7941	536	51	0	0
	O_3	7564	466	79	0	0
	NO_2	8491	0	0	0	0
	TRS	8304	200	30	2	0
	API	7674	834	0	0	0

TABLE 1b
AIR QUALITY INDEX - 1992
WEST CENTRAL REGION
HOURLY FREQUENCY DISTRIBUTION

		0 - 15 Very Good	16 - 31 Good	32 - 49 Moderate	50 - 99 Poor	100+ Very Poor
26060 KITCHENER	SO_2	8580	0	0	0	0
	COH	8113	56	3	0	0
	O_3	7782	298	16	0	0
	NO_2	8534	0	0	0	0
	CO 1 hr	8275	0	0	0	0
	CO 8 hr	8275	0	0	0	0
	API	8017	68	0	0	0
26045 WATERLOO	SO_2	4550	0	0	0	0
	COH	4612	9	0	0	0
	O_3	4670	95	1	0	0
	API	4395	0	0	0	0
28028 GUELPH	SO_2	8655	0	0	0	0
	COH	7771	12	1	0	0
	O_3	7722	429	46	0	0
	API	7756	0	0	0	0
27067 ST. CATHARINES	SO_2	8737	0	0	0	0
	COH	8307	91	11	0	0
	O_3	8137	297	24	0	0
	NO_2	8535	0	0	0	0
	CO 1 hr	8744	0	0	0	0
	CO 8 hr	8744	0	0	0	0
	API	8363	89	0	0	0
27056 NIAGARA FALLS	SO_2	8677	0	0	0	0
	COH	8505	21	0	0	0
	O_3	7776	419	34	0	0
	API	8475	18	0	0	0

TABLE 1b
AIR QUALITY INDEX - 1992
WEST CENTRAL REGION
HOURLY FREQUENCY DISTRIBUTION

		0 - 15 Very Good	16 - 31 Good	32 - 49 Moderate	50 - 99 Poor	100+ Very Poor
29000 HAMILTON DOWNTOWN	SO_2	8735	0	0	0	0
	COH	7549	540	60	0	0
	O_3	8444	231	7	0	0
	NO_2	8719	0	0	0	0
	CO 1 hr	8744	0	0	0	0
	CO 8 hr	8744	0	0	0	0
	TRS	8468	111	12	0	0
	API	6973	1252	46	0	0
29105 HAMILTON EAST	SO_2	8710	0	0	0	0
	COH	8204	195	10	0	0
	O_3	8228	230	7	0	0
	TRS	8039	12	2	0	0
	API	8047	377	0	0	0
29114 HAMILTON MOUNTAIN	SO_2	8736	0	0	0	0
	COH	8486	162	7	0	0
	O_3	8365	338	15	0	0
	NO_2	7684	0	0	0	0
	TRS	8656	67	11	0	0
	API	8262	425	0	0	0
29118 HAMILTON WEST	SO_2	8734	0	0	0	0
	COH	7855	592	65	0	0
	O_3	8404	273	11	0	0
	NO_2	8626	0	0	0	0
	CO	8180	0	0	0	0
	TRS	8351	31	2	0	0
	API	7396	1126	0	0	0

DATA ANALYSIS

Brantford

Following complaints of dust fallout, dustfall sampling was conducted at two stations near Witco Chemicals (Figure 2). Data for stations 21031 - Henry Street and 21032 - Alice/Clarence are summarized in Table 2.

The 1991/92 sampling program was a repeat of similar work done in 1979-1982. The results at that time were inconclusive. Little discernible impact by Witco could be observed. Further complaints in 1990 led to the new sampling, however, the results were as inconclusive as the earlier ones.

Out of a total of 48 monthly samples, only four exceeded the monthly objective of 7 grams/square metre. Two of these occurred during May and June 1991 at the Alice Street site where road construction was taking place, which was probably the dominant influence on the readings. One other occurred in March 1992 on Henry Street. Road/sewer construction may have caused this as well.

Apart from this routine dustfall sampling, a four month survey to measure suspended particulates (TSP) by high volume samplers was also conducted from November 1990 to March 1991. All TSP objectives were met in that survey. A report of that survey is given in Appendix 1.

Despite the lack of confirmation by measurements, visual observations of dust emissions from this company prompted a Ministry request for an abatement program, to control dust and odour. That program was completed in 1991 and has led to an end to complaints.

TABLE 2
SUMMARY STATISTICS - BRANTFORD
DUSTFALL NEAR WITCO CHEMICALS LIMITED
GRAMS/SQUARE METRE/30 DAYS

Ontario Objective 4.5 - annual
7.0 - 1 month

	Year	Average	Maximum	No. of Months Over Objective
21031 - Henry Street	1992	4.7	19.9	1
	1991	4.2	6.8	0
21032 - Alice/Clarence	1992	3.0	4.7	0
	1991	5.1	9.2	3

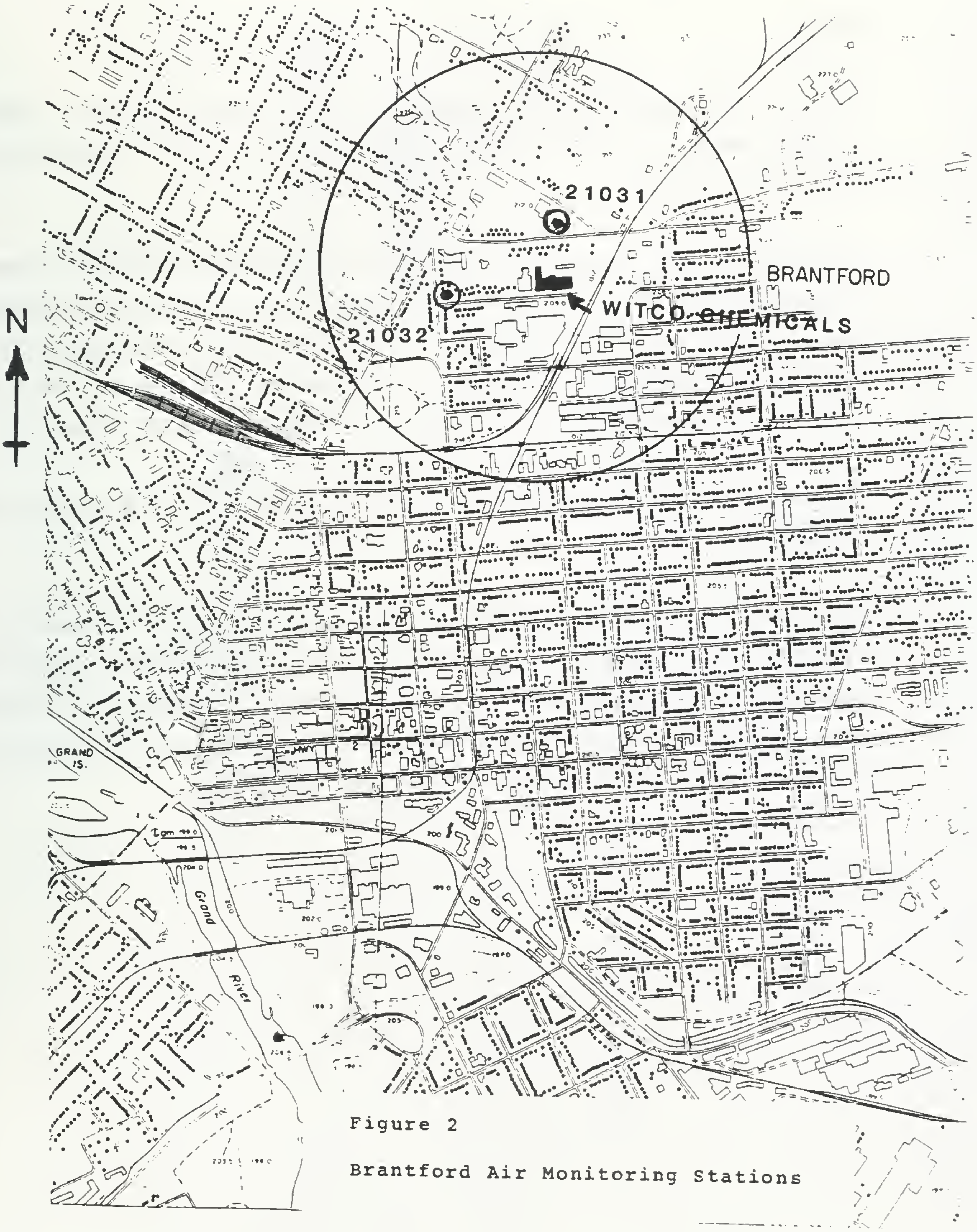


Figure 2

Brantford Air Monitoring Stations

Fergus

Dustfall near the GSW Water Products Co. was measured at station 28042 - Hill/Breadalbane. A map of the station location is shown in Figure 3 and the data is summarized in Table 3.

A total of 18 monthly samples were collected during 1991 and 1992 and 3 exceeded the monthly objective of 7 grams per square metre. These 3 samples were analyzed microscopically for the presence of iron (the suspected emission from GSW) but little was detected. The higher readings were composed mainly of silica and soot. Road dust from heavy truck traffic was a probable contributor to these readings.

Due to the low readings and lack of evidence of GSW input, the sampling was terminated.

The company instituted a control program in late 1991 which consisted of the installation of collectors on sources of welding and grinding emissions. Despite this action, the Ministry continues to receive particulate fallout complaints. The company has been requested to have the equipment manufacturers inspect the collectors and investigate other possible in-plant sources of particulate.

TABLE 3
SUMMARY STATISTICS - FERGUS
DUSTFALL NEAR GSW WATER PRODUCTS CO.
GRAMS/SQUARE METRE/30 DAYS

Ontario Objective 4.5 - annual
7.0 - 1 month

	Year	Average	Maximum	No. of Months Over Objective
28042 - Hill/Breadalbane	1992	5.2^{8}	8.4	2
	1991	4.6^{10}	9.0	1

8 - Exponent refers to number of months of samples when less than 12

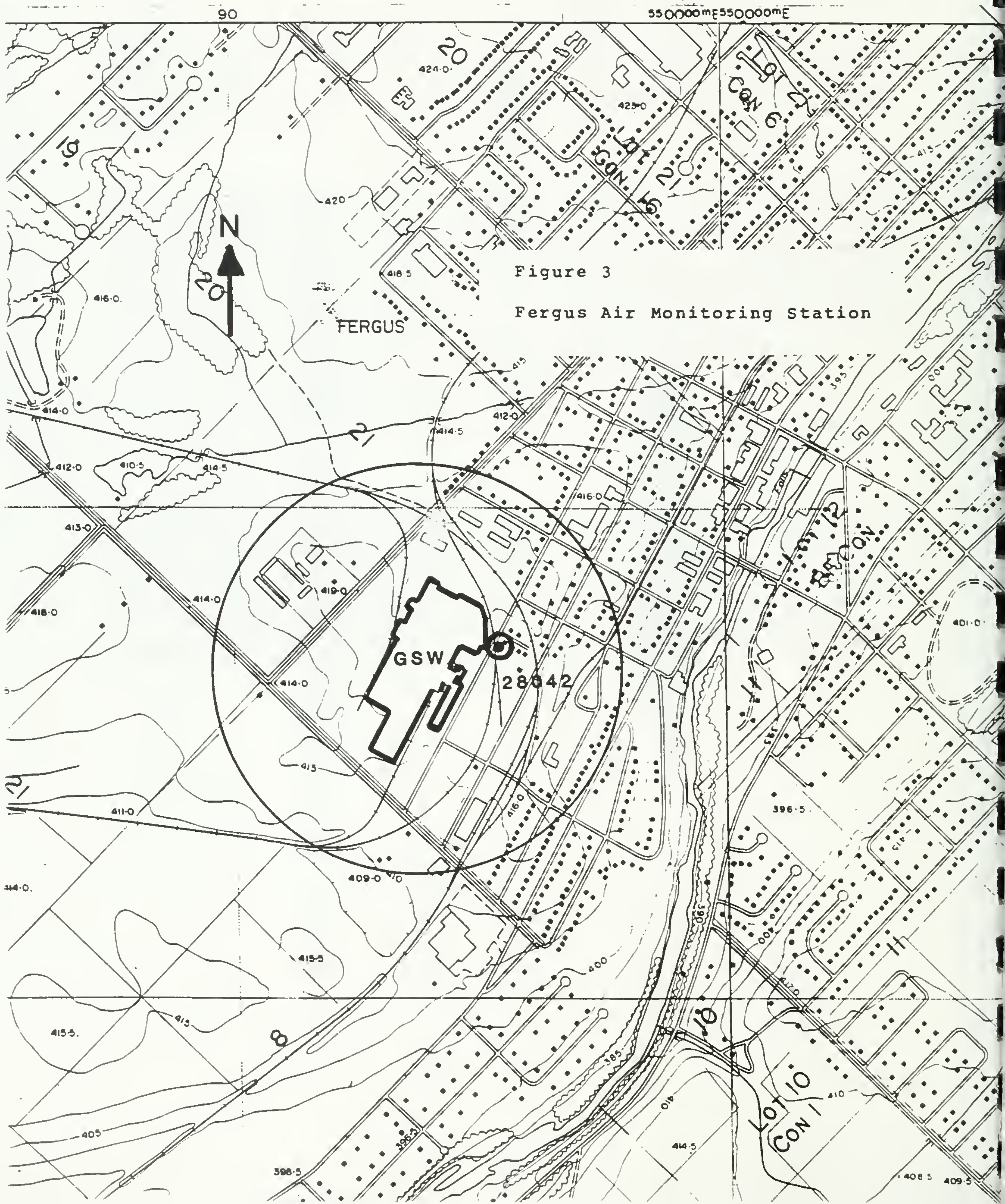


Figure 3

Fergus Air Monitoring Station

Guelph

The main station (28028) in Guelph which measures general ambient air quality is located at Exhibition Park (Figure 4).

Sulphur dioxide continued to be recorded at mostly very low levels and all objectives were met (Table 4). The SO_2 trend graph in Figure 5 illustrates the low stable concentrations measured here since 1981, well below the annual objective. In 1991 and 1992, all SO_2 readings fell in the Very Good range of the AQI.

Ozone concentrations (Table 4) exceeded the hourly objective during 46 hours in 1992 and 134 hours in 1991, all during the summer and all falling in the Moderate range of the AQI. Figure 7 shows a five year trend of annual ozone exceedances. The number observed each year is dependent on the climate of that summer.

Ground level ozone is a photochemical product of the chemical reaction between nitrogen oxides and certain hydrocarbons in the presence of sunlight. The highest levels all occurred during southerly winds and were largely imported from the United States. At these times levels were high throughout Southern Ontario. In recognition of the seriousness of the ozone problem, the Canadian Council of Ministers of the Environment decided in 1988 to develop a management plan for the control of volatile organic compounds (VOC) and nitrogen oxides (NOx) which generate ozone. A three phase program will be undertaken in Canada. The United States is undergoing its own program such that a target date of the year 2005 has been set to resolve the ground level ozone problem. Much concern is expressed also about ozone loss in the upper atmosphere where it is beneficial in reducing ultra-violet radiation. Control measures on chlorofluorocarbons (CFCs) are being implemented, however upper level ozone is not the focus of this report.

Soiling index, a measure of fine particles less than 10 microns in size, was also monitored at station 28028. Levels measured were well below the annual objective (Table 4) and the daily objective was not exceeded. All but 10 hours fell in the Very Good range of the AQI and none fell in the Moderate range (32 or higher).

TABLE 4
SUMMARY STATISTICS - GUELPH
CONTINUOUS POLLUTANTS
28028 - EXHIBITION PARK

	Year	Average	Maximum		Objectives			No Times Over Objectives	
			1 hr	24 hr	1 hr	24 hr	1 yr	1 hr	24 hr
Sulphur Dioxide (SO_2) - ppm	1992	0.003	0.06	0.02	0.25	0.10	0.02	0	0
	1991	0.003	0.06	0.02				0	0
	1990	0.004	0.09	0.02				0	0
Soiling Index COHs/1000 ft	1992	0.20		0.6		1.0	0.50		0
	1991	0.17		0.5					0
	1990	0.22		0.7					0
Ozone (O_3) - ppm	1992	0.023	.109		.08			46	
	1991	0.027	.113					134	
	1990	0.024	.099					52	

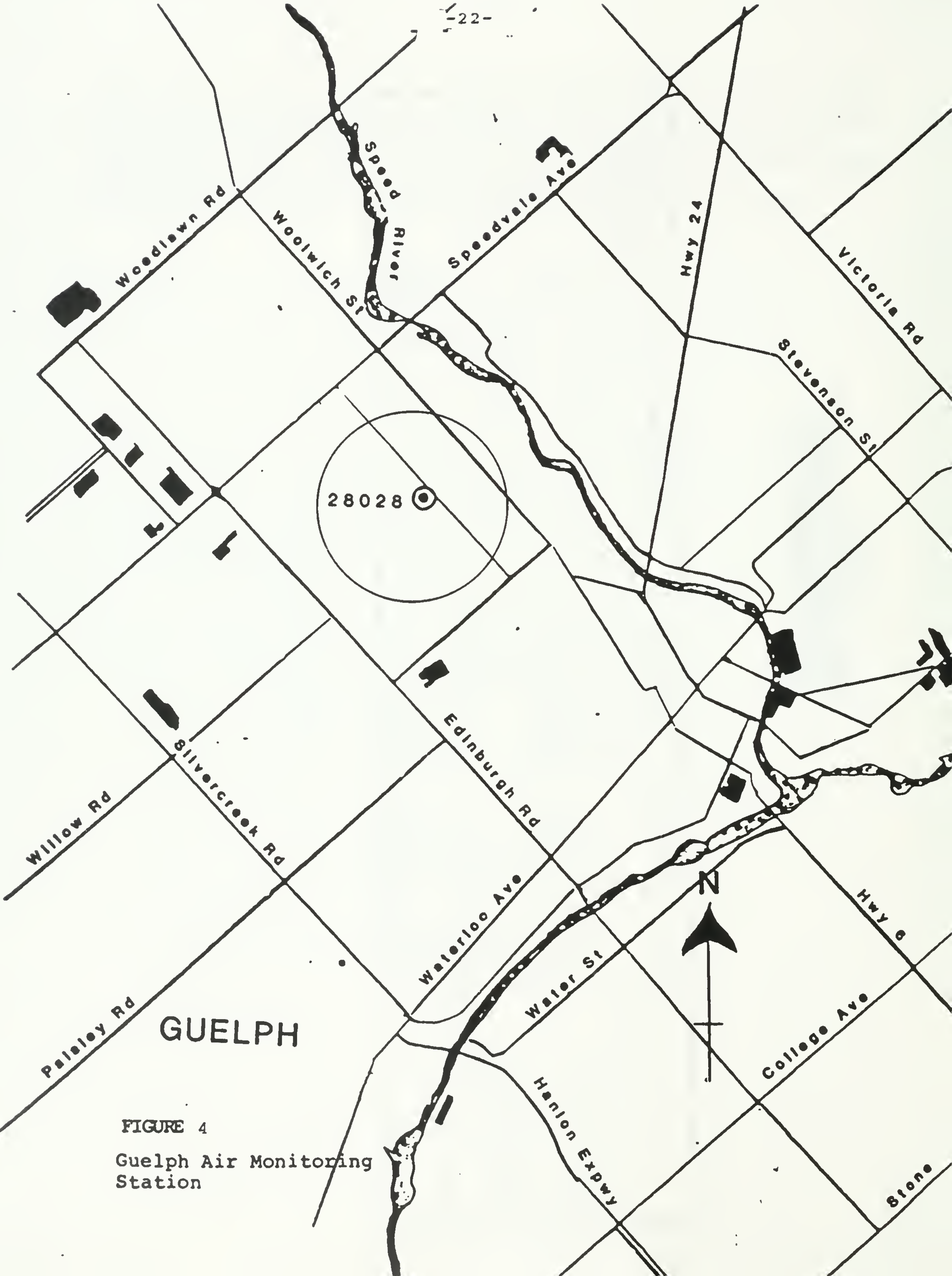
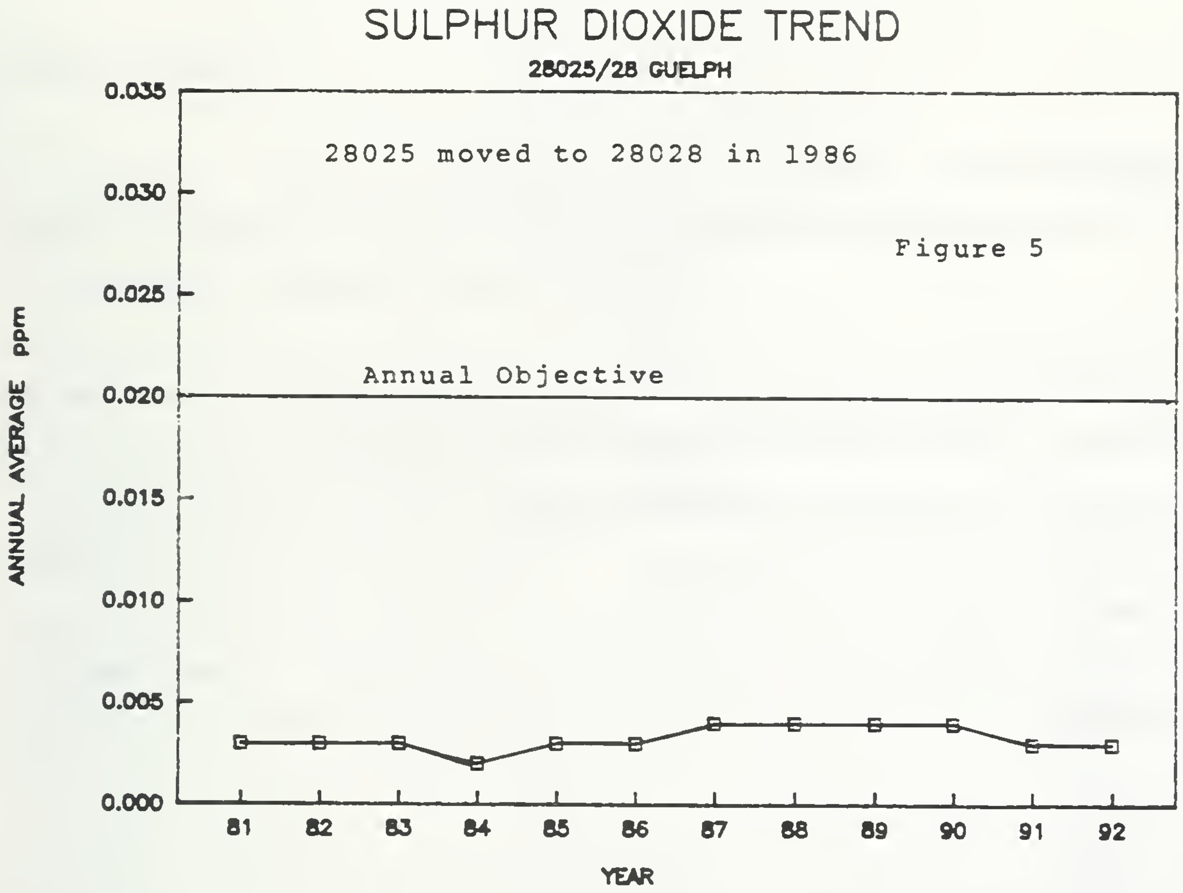


FIGURE 4

Guelph Air Monitoring Station


SULPHUR DIOXIDE TREND
28025/28 GUELPH
28025 moved to 28028 in 1986
Figure 5
Annual Objective
ANNUAL AVERAGE ppm
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
81
82
83
84
85
86
87
88
89
90
91
92
YEAR

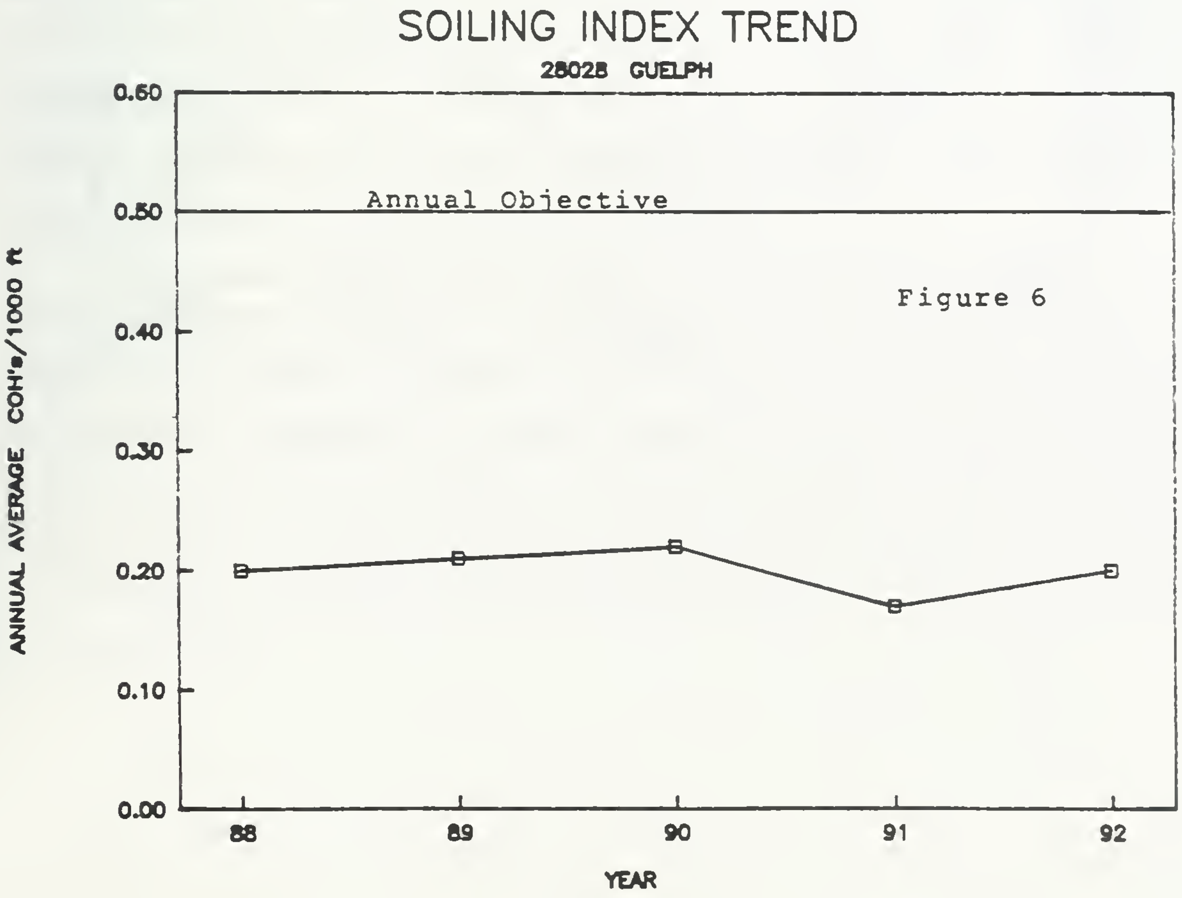
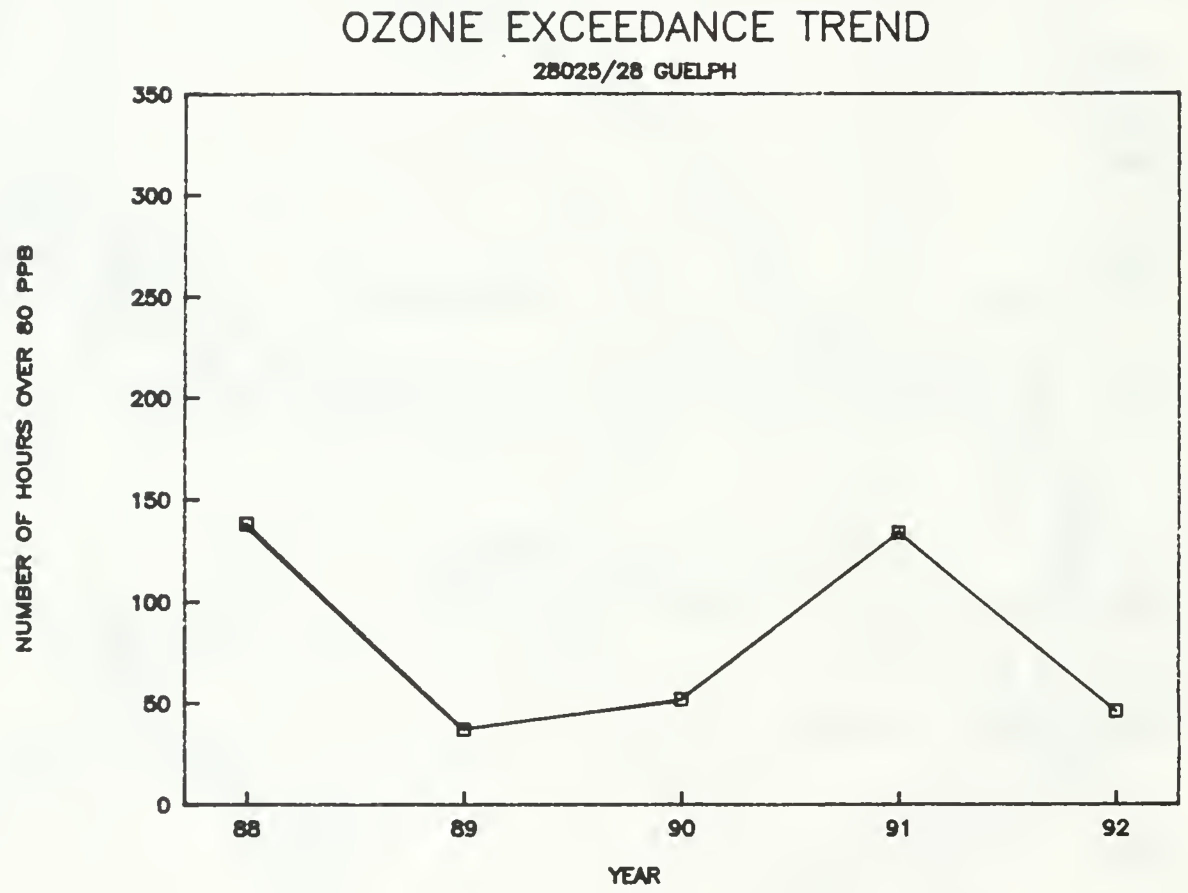

SOILING INDEX TREND
28028 GUELPH
Annual Objective
Figure 6
ANNUAL AVERAGE COH's/1000 ft
0.60
0.50
0.40
0.30
0.20
0.10
0.00
88
89
90
91
92
YEAR

Figure 7


OZONE EXCEEDANCE TREND
28025/28 GUELPH
NUMBER OF HOURS OVER 80 PPB
350
300
250
200
150
100
50
0
88
89
90
91
92
YEAR

Kitchener/Waterloo

Air monitoring in this area was conducted at station 26060 - West/Homewood in Kitchener (Table 5) and at station 26045 at Weber and University in Waterloo (Table 6). The station locations are shown in Figure 8.

The stations showed acceptable levels of sulphur dioxide (SO2), soiling index (COH), carbon monoxide (CO) and nitrogen dioxide (NO_2), meeting all criteria. Trend graphs in Figures 9 - 12 for SO_2, COH, CO and NO_2 illustrate mostly stable levels dating back as far as 1977 for the Kitchener station. Nitrogen dioxide and carbon monoxide have been declining over that time but it should be noted that the move of the station to its present location from the old site adjacent to the Conestoga Parkway caused a major decrease in 1990. Parkway traffic had been influencing the readings up to that time.

These data help formulate the Air Quality Index for the two cities. The data given in Tables 1a and 1b shows that with the exception of ozone (O_3), soiling index (COH) and API, the readings all fall in the Very Good range of the AQI. The higher API readings were driven by the COH values. The COH displayed 4 total hours (in 1991/92) in the moderate range at Kitchener, all during rush hours. Traffic was probably the major contribution to these readings.

The Kitchener station measured 16 hours above the hourly ozone objective of 80 ppb in 1992 and 77 hours in 1991 while Waterloo measured only 1 hour in 1992 and 8 hours in 1991, all falling in the Moderate range of the AQI. The Waterloo station terminated in July 1992, so most of that summer was missed. Trends in ozone are shown in Figure 13. Slightly higher levels tend to be found in Kitchener probably due to the Waterloo station being somewhat more affected by ozone scavenging effects by vehicle traffic.

As mentioned earlier, a NOx/VOC control program in Canada and the United States is being implemented in a three phase approach with the goal of resolving the ground level ozone problem by the year 2005.

The termination of the Waterloo station in 1992 was due to its proximity to Kitchener. The Waterloo unit was moved to Elmira due to the need there. The Kitchener AQI station will now represent the area.

TABLE 5
SUMMARY STATISTICS - KITCHENER
CONTINUOUS POLLUTANTS
26060 - WEST AVENUE/HOMEWOOD

	Year	Average	Maximum 1 hr	Maximum 8 hr	Maximum 24 hr	Objectives 1 hr	Objectives 8 hr	Objectives 24 hr	Objectives 1 yr	No Times Over Objectives 1 hr	No Times Over Objectives 8 hr	No Times Over Objectives 24 hr
Sulphur Dioxide (SO_2) - ppm	1992	0.003	0.07		0.04	0.25		0.10	0.02	0		0
	1991	0.003	0.06		0.02					0		0
	1990	0.002	0.03		0.01					0		0
Soiling Index COHs/1000 ft	1992	0.23				0.9		1.0	0.50			0
	1991	0.24				0.8						0
	1990	0.25				1.0						0
Carbon Monoxide (CO) - ppm	1992	0.4	6	3		30	13			0	0	
	1991	0.6	10	5						0	0	
	1990	0.5	6	5						0	0	
Nitrogen Dioxide (NO_2) - ppm	1992	0.015	0.06		.04	.20		.10		0		0
	1991	0.013	0.07		.04					0		0
	1990	0.011	0.05		.03					0		0
Ozone (O_3) - ppm	1992	0.023	.099			.08				16		
	1991	0.027	.118							77		
	1990	0.021	.097							16		

TABLE 6
SUMMARY STATISTICS - WATERLOO
CONTINUOUS POLLUTANTS
26045 - WEBER/UNIVERSITY

	Year	Average	Maximum		Objectives			No Times Over Objectives	
			1 hr	24 hr	1 hr	24 hr	1 yr	1 hr	24 hr
Sulphur Dioxide (SO_2) - ppm	1992	0.004[7]	0.05	0.03	0.25	0.10	0.02	0	0
	1991	0.004	0.07	0.02				0	0
	1990	0.002	0.04	0.01				0	0
Soiling Index COHs/1000 ft	1992	0.19[7]		0.6		1.0	0.50		0
	1991	0.19		0.6					0
	1990	0.20		0.9					0
Ozone (O_3) - ppm	1992	0.018[7]	.082		.08			1	
	1991	0.020	.085					8	
	1990	0.020	.084					4	

7 - 7 months of sampling - Station terminated July 1992

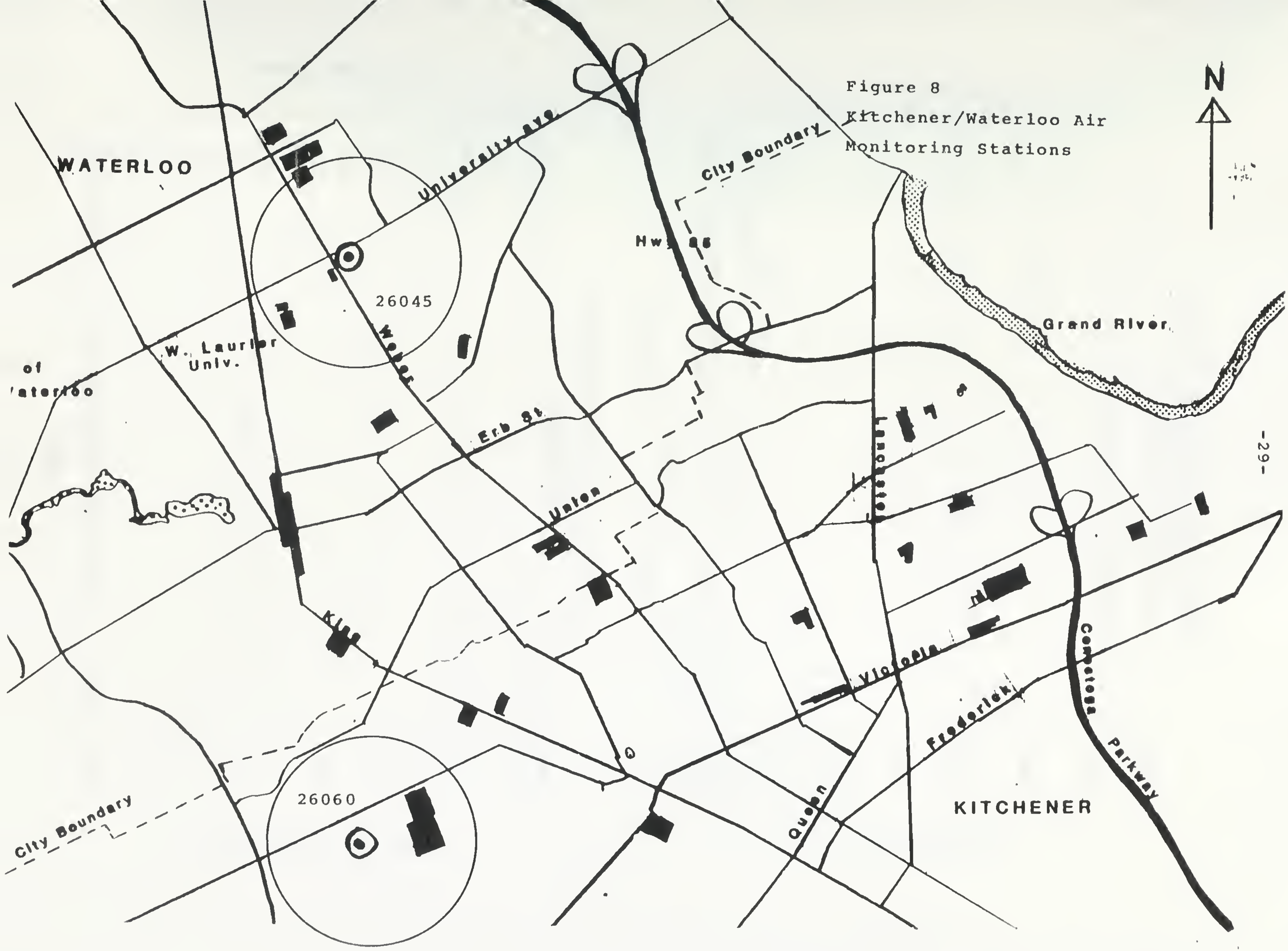
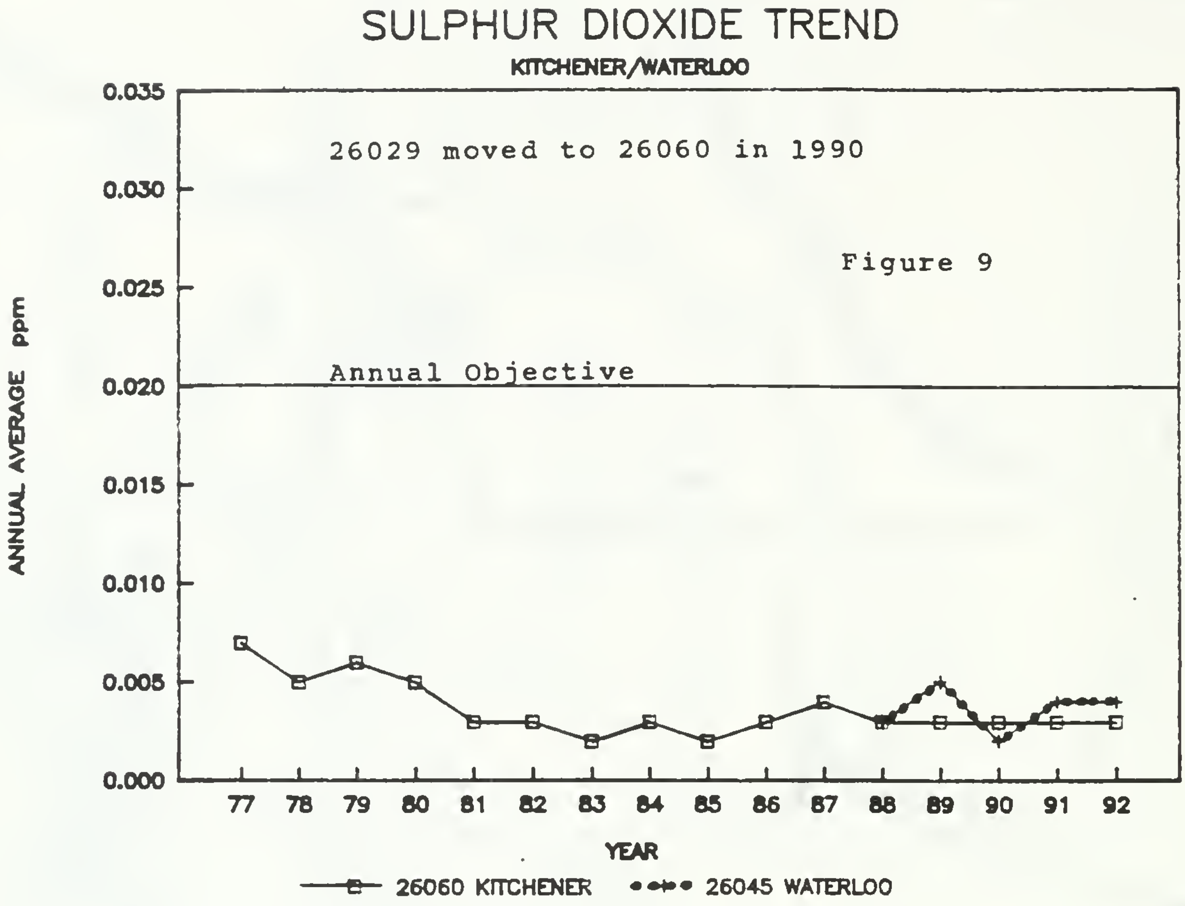
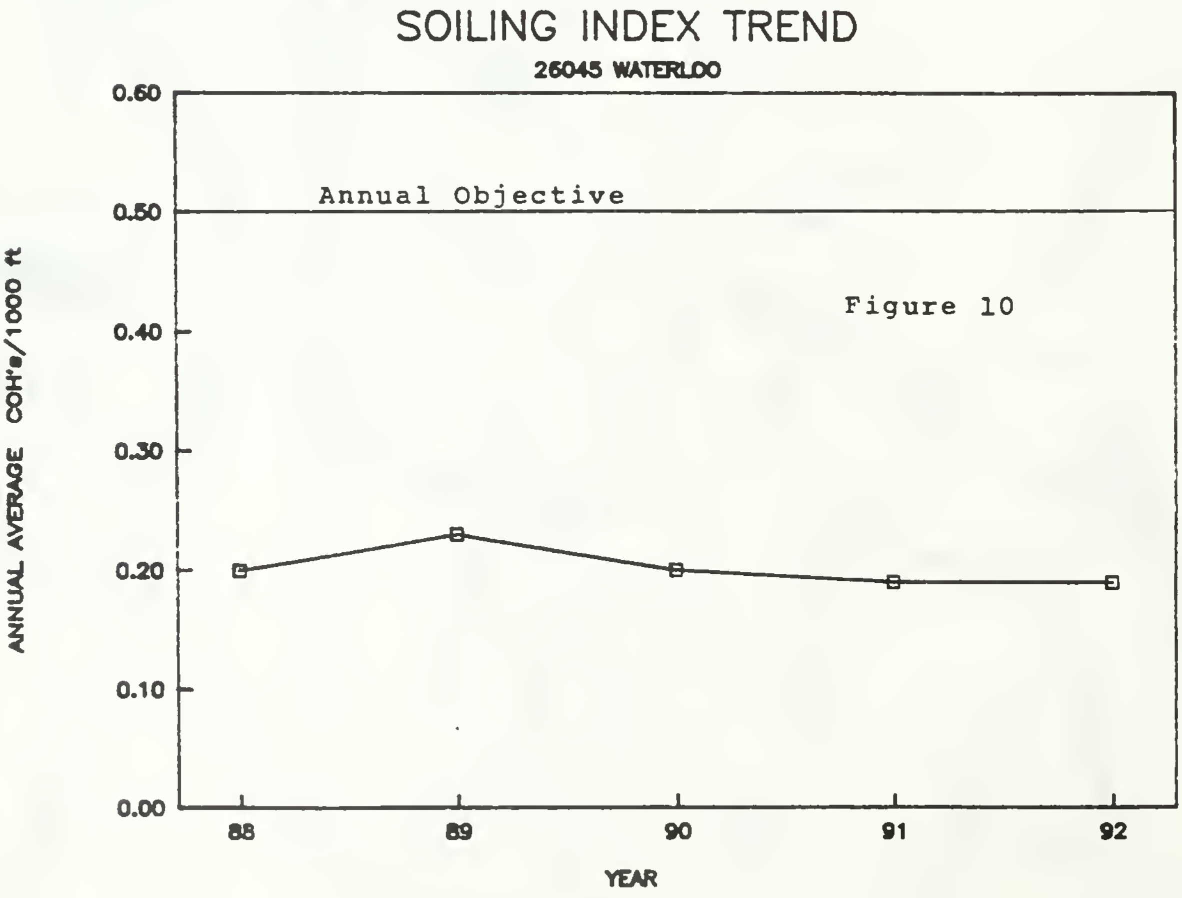


Figure 8
Kitchener/Waterloo Air
Monitoring Stations


SULPHUR DIOXIDE TREND
KITCHENER/WATERLOO
26029 moved to 26060 in 1990
Figure 9
Annual Objective
ANNUAL AVERAGE ppm
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
YEAR
26060 KITCHENER
26045 WATERLOO


SOILING INDEX TREND
26045 WATERLOO
Annual Objective
Figure 10
ANNUAL AVERAGE COH's/1000 ft
0.60
0.50
0.40
0.30
0.20
0.10
0.00
88
89
90
91
92
YEAR

NITROGEN DIOXIDE TREND

26029/60 KITCHENER

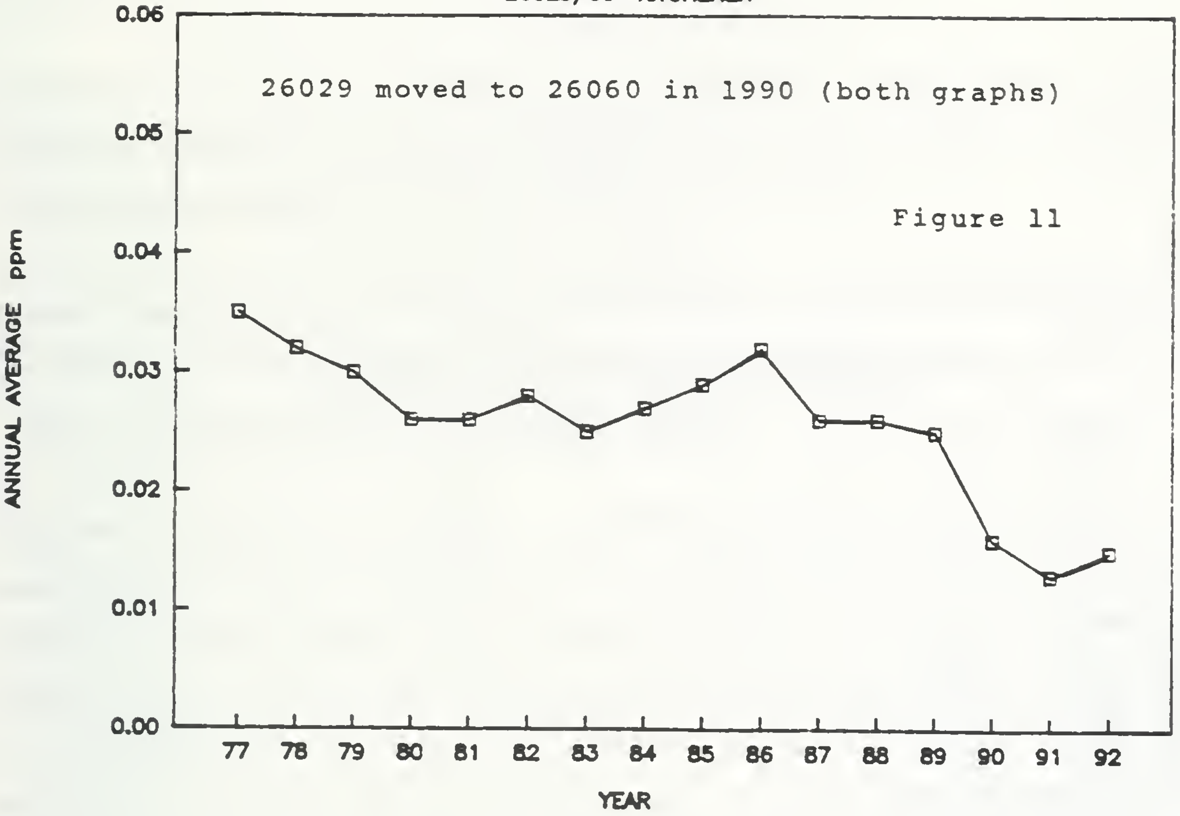

26029 moved to 26060 in 1990 (both graphs)

Figure 11

CARBON MONOXIDE TREND

26029/60 KITCHENER

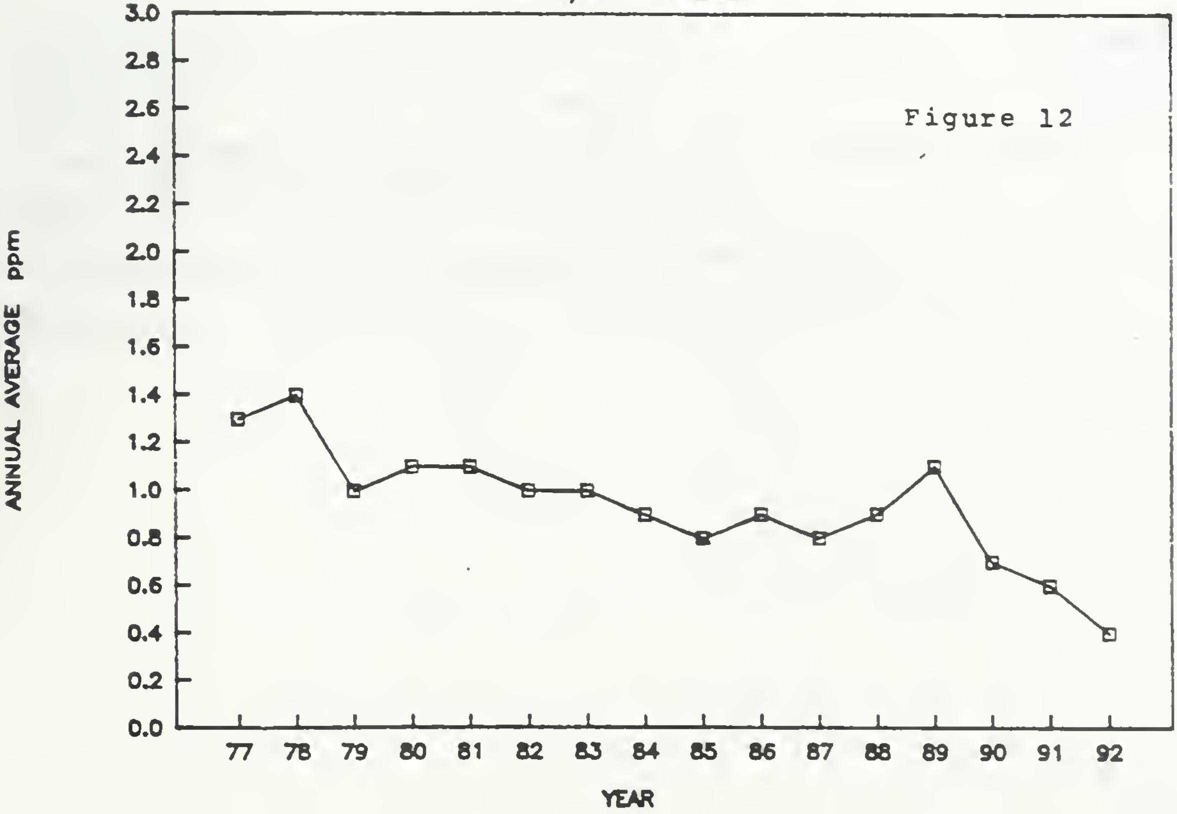
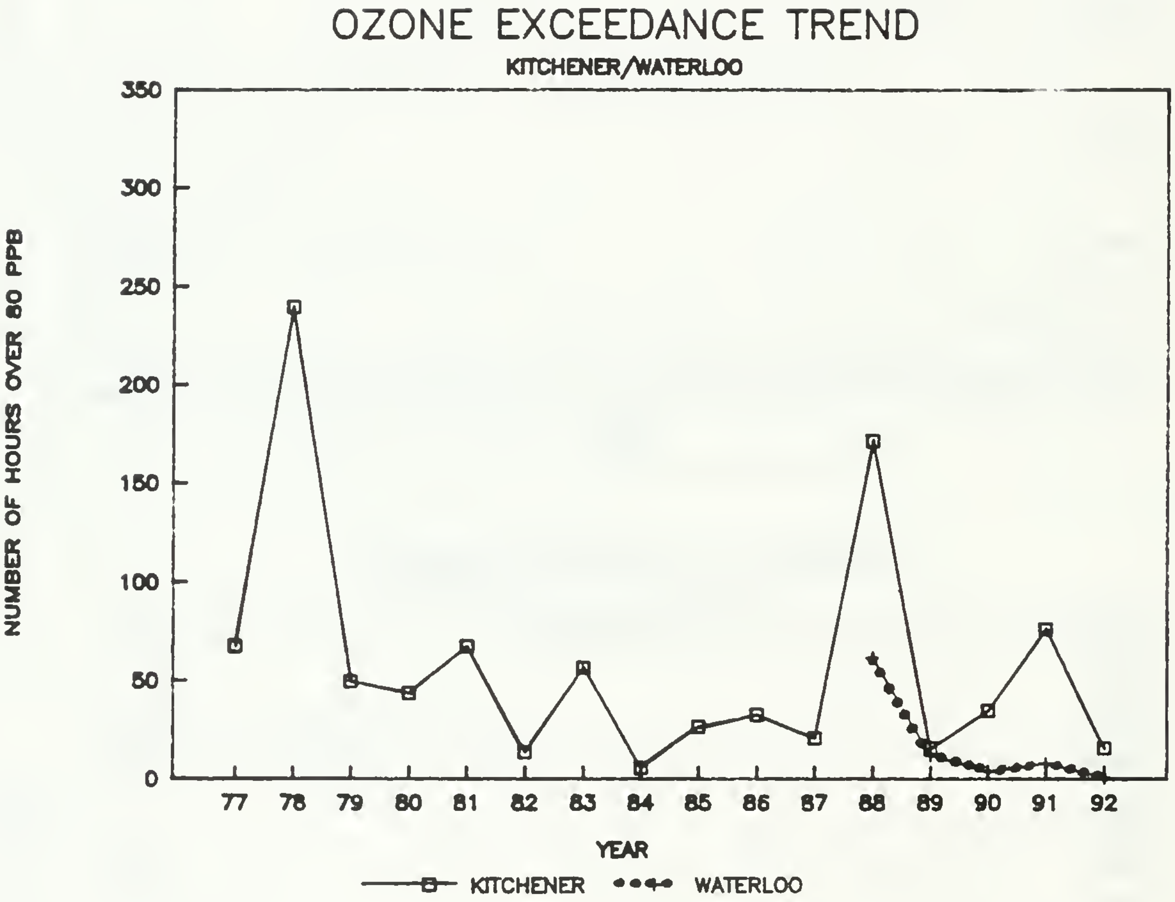


Figure 12

Figure 13


OZONE EXCEEDANCE TREND
KITCHENER/WATERLOO
NUMBER OF HOURS OVER 80 PPB
350
300
250
200
150
100
50
0
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
YEAR
KITCHENER
WATERLOO

SUMMARY

This report has summarized the results of ongoing air monitoring in the Brant, Waterloo and Wellington areas. Industries causing air pollution problems have initiated or completed abatement programs to reduce their emissions.

General air quality as characterized by stations in Guelph, Kitchener and Waterloo was very good, with the exception of ozone episodes during the summer, which were common to the rest of Southern Ontario.

Long term programs in both Canada and the United States are being implemented to overcome the ground level ozone problem, but as an interim measure there is a joint Federal/Provincial initiative to forecast high ozone days in the summer in routine weather reports. The public will be advised that sensitive individuals may experience respiratory symptoms and should alter their activities accordingly. The public will be encouraged to reduce their use of automobiles, to car pool, to use public transit and to avoid the use of paints and solvents and gasoline powered equipment such as lawn mowers.

Much of the air monitoring is automated and linked via a Province-wide telemetry system. This system permits all of the Ministry's stations with continuous analyzers to send data directly to a central computer facility in Toronto allowing for data availability on a real-time basis. This new system allows for immediate access to data in Hamilton and in Toronto, and also allows for remote control and maintenance of the instruments. All of this results in a more efficient monitoring program.

One purpose of the telemetry system is to facilitate the Air Quality Index (AQI). The AQI is a function of six different pollutants, which form up to eight separate subindices. Concentrations of sulphur dioxide, soiling index, carbon monoxide, nitrogen dioxide, total reduced sulphur and ozone are all individually converted to a common scale of index numbers with the same advisory or alert levels as the previous API i.e., 32, 50, 75 and 100. Not all stations measure all of the parameters, but the highest hourly subindex is reported several times daily to the public. The pollutant measured by this subindex may also be identified. The intent of the new index is to better inform the people of Ontario of air quality in their local area.

APPENDIX 1

Technical Assessment Section
Air Resources Unit
West Central Region

July 3, 1991

Particulate Survey Of Witco Chemicals Limited - Brantford

Concerns of particulate emissions from Witco Chemicals Limited in Brantford, prompted a return air monitoring survey by high volume (hivol) sampling in 1990/1991. Dustfall sampling had been conducted from 1979 to 1982 and a single high volume (hivol) sampler was run during 1979-1980. All of these earlier data yielded inconclusive results. Little discernible impact by Witco could be observed.

In November 1990, two hivols/dustfalls were installed, one on each side of the company. One station, #21031 was located on the roof of J. Bowman Ltd, at 35 Henry Street about 100 metres northeast of Witco. The second station, #21032, was located in the yard of a private residence at 10 Alice Street (near Clarence) about 150 metres west of Witco, see attached map. Hivol samples were taken simultaneously every third day from midnight to midnight during the period November 7, 1990 to March 31, 1991. All TSP, data and corresponding wind data are given in Table 1. Dustfall measurements commenced in December, 1990.

1. Correlation with Wind Direction and Wind Speed

The TSP data were correlated with wind direction frequency (hours per sample) and wind speed parameters. Unfortunately, local Brantford wind data were unavailable and data from MOE station 29026 in east Hamilton had to be utilized. This data appeared mostly similar to Mount Hope Airport data (Environment Canada) indicating conditions in Brantford should have been similar. The Mount Hope data were used for further corroboration of analysis in a following section of this report.

For most of the survey, up to February 22, 1991, Witco operated continuously. From Feb 23 to the end of the survey, Witco did not operate on weekends. As only four weekend samples dates were taken from that point on, there was no attempt to separate weekday vs weekend correlations. The correlation coefficients (r) are given in Table 2. As a guide, a perfect correlation would yield a r=1.00.

For both stations 21031 and 21032, no wind direction or wind speed parameter correlated significantly positive.

2. Statistics

The geometric means were 39 ug/m^3 at 21031 - Henry and 48 ug/m^3 at 21032 - Alice, both below the annual objective of 60.

The daily objective of 120 ug/m^3 was not exceeded at either station. The maxima for the two stations were 85 ug/m^3 and 107 ug/m^3 (21031 and 21032 respectively).

3. Upwind /Downwind

Table 3 isolates those days when either 21031 - Henry or 21032 - Alice were downwind of Witco. Mount Hope Airport wind data were used to verify conditions on these dates. There were eleven dates when station 21031 - Henry was downwind of Witco and four dates when 21032 - Alice was downwind. The upwinds/downwinds were about the same during the 11 SSW days, but the 4 east wind days did show a higher downwind average (64 vs 34). However, this lower upwind mean was influenced largely by one low reading of only 5 ug/m^3. Such a low reading must be held as suspect data. Without this anomaly the other three upwind/downwinds averaged 66 and 61 ug/m^3, ie. similar.

4. Conclusions

This survey indicates that Witco Chemicals particulate emissions are not significant enough to be discerned by air sampling, even though Ministry abatement staff have witnessed visible particulate emissions and odours and complaints continue to occur. The first three months of dustfall sampling (December to February) all show low dustfall loading, well below objectives.

Due to the District staff's observations, the company was asked to undertake abatement measures, and control equipment for both odour and particulate is scheduled to be installed by the fall of 1991.

F. Dobroff

FD-17

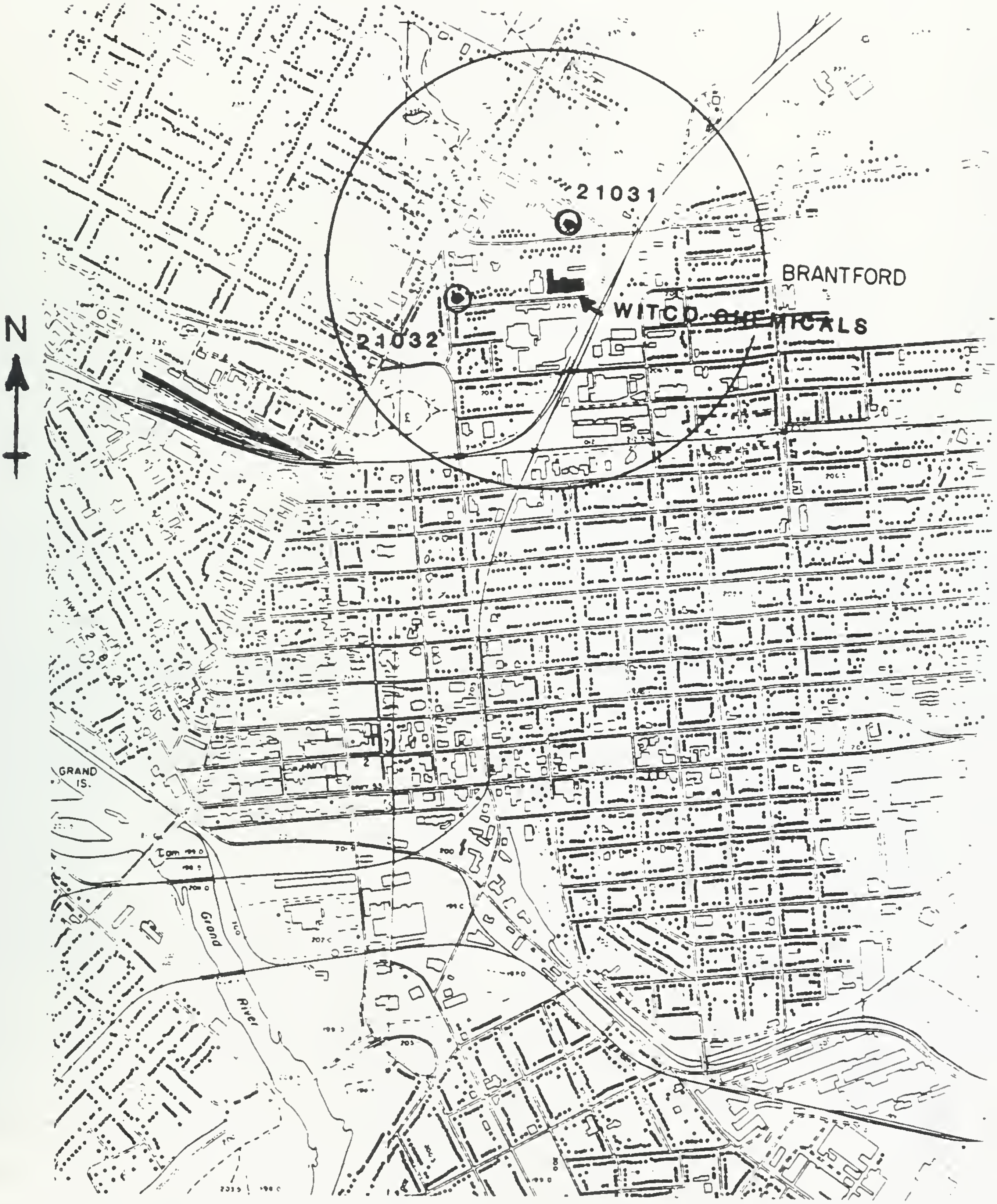

21031
21032
BRANTFORD
WITCO CHEMICALS
N
GRAND IS.
Grand River

TABLE 1

HIVOL SURVEY OF WITCO CHEMICALS - BRANTFORD

ONTARIO OBJECTIVES : TSP - 120 (24 hour).60 (annual geo.mean)

	1990 DATE	HOURS OF WIND/DAY WOODWARD AVE, HAMILTON N	NE	E	SE	S	SW	W	NW	CALM	AVG SPEED km/hr	ug/m3 21031 35 Henry St TSP	21032 Alice/Clarence TSP	
	NOV 7	0	0	0	0	0	9	15	0	0	10	11	20	
SAT	10	3	2	0	0	0	2	7	3	7	8	33	26	
	13	0	0	0	0	0	3	6	15	0	13	4	29	
	16	1	0	0	0	0	19	2	2	0	18	20	43	
	19	3	0	5	2	0	5	0	0	9	4	5	72	
	22	0	0	0	0	3	17	0	0	4	9	44	41	
SUN	25	0	0	0	0	0	8	15	0	1	16	36	43	
	28	0	0	0	0	4	14	6	0	0	20	43	32	
SAT	DEC 1	0	0	0	0	0	24	0	0	0	17	17	33	
	13	0	0	0	0	0	3	18	3	0	21	25	31	
SUN	16	1	0	0	0	0	5	10	8	0	10	30	40	
	19	3	2	0	0	0	10	6	3	0	11	32	47	
SAT	22	0	0	0	0	0	9	4	0	11	6	39	29	
XMAS	25	0	0	0	0	0	24	0	0	0	18	54	47	
	28	0	0	5	4	2	6	0	0	7	7	34	42	
	31	0	0	0	0	0	10	8	6	0	11	17	24	
1991														
	JAN 3	3	0	0	0	0	17	1	0	3	11	31		
SUN	6	2	0	0	0	0	7	10	1	4	6	45	54	
	9	1	0	0	0	1	13	2	0	7	9	35	31	
SAT	12	10	0	4	0	0	0	0	8	2	9	31	30	
	15	0	1	4	1	12	1	1	0	4	6	52	66	
	18	0	0	0	0	0	17	7	0	0	21	39	53	
	21	12	0	0	0	0	0	4	8	0	13	79	102	
	24	2	0	0	0	0	11	9	2	0	16	49	54	
SUN	27	0	0	0	0	0	24	0	0	0	17	68	53	
	30	16	0	0	0	0	2	1	4	1	10	46	48	
SAT	FEB 2	0	0	0	0	4	19	1	0	0	14	62	60	
	5	0	0	0	0	0	18	3	0	3	10	76	72	
	8	0	0	0	0	0	20	4	0	0	15	73	66	
	11	1	0	0	0	0	0	9	14	0	15	51	67	
	14	10	0	5	0	1	0	4	2	2	12	36	36	
SUN	17	2	0	3	4	0	12	0	1	2	11	38	40	
	20	0	0	0	0	0	24	0	0	0	15	83		
SAT	23	9	5	8	1	0	0	1	0	0	11	47	48	
	26	9	0	0	0	4	7	1	2	1	11	45	65	
	MAR 1	0	0	2	1	2	6	0	0	13	5	85	107	
	5	0	0	0	1	3	18	1	0	1	8	72	69	
	7	0	0	0	0	21	3	0	0	0	22	59	68	
SUN	10	6	2	4	1	3	0	7	0	1	11	41	46	
	13	8	8	8	0	0	0	0	0	0	15	77	106	
SAT	16	0	0	0	0	1	11	9	1	2	8	75	103	
	19	0	0	0	0	0	0	20	4	0	16	45	58	
	22	0	15	9	0	0	0	0	0	0	25	78	45	
	25	3	0	0	0	0	0	17	4	0	11	32	34	
	28	0	0	0	0	0	23	1	0	0	25	65	67	
SUN	31	0	0	1	1	8	12	0	0	2	10	37	39	
												46	44	n
												39	48	Geo Mean

TABLE 2

WITCO CHEMICALS HIVOL SURVEY
CORRELATION COEFFICIENTS (r)
Hours of Wind Direction & Wind Speed VS TSP

	21031 - Henry St	21032 - Alice/Clarence
N	0.02	0.14
NE	0.28	0.10
E	0.14	0.13
SE	-0.11	0.02
S	0.13	0.14
SW	0.16	-0.04
W	-0.30	-0.23
NW	-0.28	-0.11
CALM	-0.04	0.10
Avg Wind Speed	0.18	-0.06

TABLE 3

HIVOL SURVEY OF WITCO CHEMICALS - BRANTFORD

SSW DAYS WHEN 21031 DOWNWIND

	1990 DATE	HOURS OF WIND/DAY WOODWARD AVE. HAMILTON N	NE	E	SE	S	SW	W	NW	CALM	AVG SPEED km/hr	ug/m3 21031 35 Henry St TSP	21032 Alice/Clarence TSP	
	NOV 7	0	0	0	0	0	9	15	0	0	10	11	20	
	16	1	0	0	0	0	19	2	2	0	18	20	43	
	22	0	0	0	0	3	17	0	0	4	9	44	41	
	28	0	0	0	0	4	14	6	0	0	20	43	32	
SAT	DEC 1	0	0	0	0	0	24	0	0	0	17	17	33	
XMAS	25	0	0	0	0	0	24	0	0	0	18	54	47	
	JAN 15	0	1	4	1	12	1	1	0	4	6	52	66	
SUN	27	0	0	0	0	0	24	0	0	0	17	68	53	
SAT	FEB 2	0	0	0	0	4	19	1	0	0	14	62	60	
	MAR 5	0	0	0	1	3	18	1	0	1	8	72	69	
SUN	31	0	0	1	1	8	12	0	0	2	10	37	39	
												11	11	n
												38	43	Geo Mean

HIVOL SURVEY OF WITCO CHEMICALS - BRANTFORD

EAST DAYS WHEN 21032 DOWNWIND

	DATE	HOURS OF WIND/DAY WOODWARD AVE, HAMILTON N	NE	E	SE	S	SW	W	NW	CALM	AVG SPEED km/hr	ug/m3 21031 35 Henry St TSP	21032 Alice/Clarence TSP	
	NOV 19	3	0	5	2	0	5	0	0	9	4	5	72	
SAT	FEB 23	9	5	8	1	0	0	1	0	0	11	47	48	
	MAR 13	8	8	8	0	0	0	0	0	0	15	77	106	
	22	0	15	9	0	0	0	0	0	0	25	78	45	
												4	4	n
												34	64	Geo Mean